WWE
MEMORANDUM

To: Project File #961-102.040

From: Wright Water Engineers, Inc.
Ryan Unterreiner

Date: October 6, 2000

Re: Little Salt Creek Bioassessment

Wright Water Engineers, Inc. (WWE) met with Dr. Edwin Herricks on September 15 and 16 in Lincoln, Nebraska with two intentions: 1) to complete a reconnaissance survey of subbasins N1-N5 (north) and S1-S3 (south) and 2) to collect benthic macroinvertebrates at various reaches in the north and south watersheds. The purpose was to provide the City of Lincoln and Olsson Environmental with an indication of the quality of these drainages with regard to aquatic life, watershed development and stormwater management and the possible extent to which they may be improved and/or protected by future development plans.

NORTH AND SOUTH BASINS

WWE, with Dr. Herricks, completed a reconnaissance survey of the north and south watersheds within a limited timeframe. Eight subbasins in the north and south watersheds were observed and photo-documented. This information will be provided by Dr. Herricks and will afford insight into the current condition of the watersheds and creeks with respect to watershed development and stormwater management.

BENTHIC MACROINVERTEBRATE SAMPLING

Benthic macroinvertebrate samples were collected at three locations from Little Salt Creek in the north watershed. Habitat Assessment Field Data Sheets, provided by the Environmental Protection Agency (EPA) Rapid Bioassessment Protocol (RBP), and general sketches of the stream were also completed at each location. The purpose was to determine the instream habitat and conditions of the macroinvertebrate community prior to development as well as to establish the existing conditions of Little Salt Creek as it meanders through the north watershed.

The south watershed was dry at the time of our visit. The three subbasins contained in this watershed (S1-S3) had defined bed and banks in drainages but are likely intermittent streams. Benthic macroinvertebrate sampling in the south watershed was not possible due to a lack of water.

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Dr. Herricks used a dipnet for sampling a variety of habitats, including silt, sand and gravel substrate, vegetation along the banks and in the channel. An average of twenty jabs was used per station.

Site 01R1

This site was located on Northwest 12th Road, North of Waverly Road, downstream the bridge spanning Little Salt Creek. The purpose for sampling at this location was to establish a "reference site" and determine baseline conditions upgradient in the watershed. This location will remain relatively unchanged by future development.

Banks were relatively steep at approximately 2:1 and consisted mainly of grasses, with occasional emergent grasses at the channel edge. Duckweed was present in this reach of the stream. There was a high silt content in the substrate with occasional sand and gravel. Woody debris provides good habitat for turtles, fish and macroinvertebrates. There is relatively good channel variability in this reach of the stream with pools, a narrow channel and an upland bar.

Site 01

This site was located downstream of the Waverly Road Bridge across Little Salt Creek. There was a relatively steep grade at this location causing an increased flow and channel regime. Artificial substrate (riprap) existed from the bridge construction but substrate mainly consisted of silt with occasional sand and gravel. Periphyton on the channel bottom silt implied some length of stability of the stream. There was a visible difference in the extent of channilization as compared to the reference site. Vegetation along the banks consisted mainly of grasses. The stream had also become slightly more eroded as evidenced by the exposed salt hardpan located approximately 200 yards downstream at a steep eroded bank.

Site 05

This site was located downstream of the Arbor Road Bridge and 27th Street at the lower end of the watershed. There was extreme channelization at this location and an abundance of sediment in the substrate. Filamentous algae lined the channel and provided a substrate for sampling. There was very little in the way of vegetative cover for fish or macroinvertebrates.

Successive sampling at these locations during and following development of the watershed could provide a good indication as to the impact development may have had, or is having on the biological community.

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PROCEDURE

WWE separated the samples from detritus and debris using the sugar flotation technique. The samples were then analyzed and separated into their respective taxonomic groups to the Family level. Several "metrics," as described in EPA's RBP, were calculated to assess the character of the macroinvertebrate community at each location. The results of this analysis are provided as attachments.

ANALYSIS

Table 1 provides the metrics that describes the general health of the macroinvertebrate community, and also the habitat score rating. Each metric measures a different component of community structure and has a different range of sensitivity to pollution stress.

TABLE 1

Metric Calculations for Little Salt Creek Sampling Sites

METRIC	Sample Location		
	O1R1	O1	O5
Taxa Richness	16	11	6
Scraper - Filtering Collector Ratio	0.009	0	0
EPT - Chironomidae Ratio	0.6	0.9	0.5
Percent Contribution of Dominant Taxon	24%	33%	40%
EPT Index	3	1	0
Modified FBI	5.5	5.1	5.9
Habitat Score	127	109	75

A brief description and explanation of metric results from the three sample stations are discussed below.

Taxa Richness

This metric reflects the health of the community in terms of the variety of taxa present. The decreasing number of taxa present in the samples downstream indicates reduced diversity due to water quality, habitat diversity or habitat suitability of the stream. Generally speaking, habitat conditions in Little Salt Creek diminished downstream through the watershed as a result of increased channelization and erosion and reduced available substrate.

Scraper—Filtering Collector Ratio

This metric reflects the riffle/run community food base. The predominant feeding strategy in the three samples was Filtering Collectors. Filamentous algae (observed in the field) provide good attachment sites for Filtering Collectors. The dominance of Filtering Collectors indicates an overabundance of filamentous algae and the presence of few diatoms in the Little Salt.

EPT—Chironomidae Ratio

This metric measures community balance. Species in the Orders Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) are relatively sensitive, while chironomids are generally insensitive to stress. Mayflies and caddisflies were found in small numbers in samples O1R1 and 05. Sample 01 contained a comparatively high number of caddisflies (Hydropsychidae). This may be explained by the slight increase in gradient at this location, allowing for a riffle and run habitat to exist thereby enhancing habitat variability and suitability. The artificial substrate (riprap) at the bridge also increased available substrate.

Percent Contribution of Dominant Taxon

This metric is another indicator of community balance. Values for this metric increase in a downstream direction, which suggests diminished conditions in the creek. This was consistent with conditions noted in the field.

EPT Index

These Orders were poorly represented in all three samples. These Orders represent sensitive taxonomic groups and the lack of representation indicates poor biotic conditions overall.

Modified FBI

The Modified Family Biotic Index (FBI) tolerance values range from 0 to 10, with a higher value assigned to more tolerant organisms. The FBI was relatively constant at all sites, and lowest at site 01.

Habitat Assessment

Habitat, as affected by instream and surrounding topographical features, is a major determinant of aquatic community potential. Both the quality and quantity of available habitat affect the structure and composition of resident biological communities. Habitat parameters are evaluated and given a score. Scores increase as habitat quality increases. Reference site 01R1 was given the highest score with habitat quality diminishing for the two downstream sites.

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CONCLUSION

Little Salt Creek consistently lacks rooted, woody vegetation on its banks, and the lack of woody vegetation may be a result of saline soils. Eroded materials comprise most of the instream substrate, and are poor habitat for macroinvertebrates. High natural saline conditions and agricultural runoff have likely contributed to diminished water quality and more tolerant species. In addition, an overabundance of filamentous algae has created an imbalance in feeding groups. It was apparent the riparian and in-stream conditions diminished as the Little Salt Creek flowed through the watershed, which is likely a result of increased channelization and erosion of bank materials.

The results of the macroinvertebrate sampling showed that a healthier community exists at the upstream site 01R1, but that the community is relatively limited at all sites. Comparison to data collected from other, similar streams could help to define "optimal" conditions for Little Salt Creek, and the amount of impairment currently present.

The Little Salt Creek is a stream subject to its natural environment. While bank stabilization techniques are recommended to minimize erosion, high salinity and poor water quality may limit the integrity of the biological community.

Attachments

cc: Dr. Ed Herricks, University of Illinois (Champaign-Urbana)
John Cambridge, Olsson Environmental

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LITTLE SALT CREEK BIOASSESSMENT
ORGANISM DATA SHEET - UPSREAM REFERANCE STATION - SAMPLE 01R1

Project Name and Number: City of Lincoln
Station Number/Sample I.D.: Upstream Reference 01R1
Sample Date: September, 2000

Identifying Scientist: R. Ulmmeier
Identification Date: September, 2000

PHYLUM	CLASS	ORDER	SUBORDER	FAMILY	QUANTITY	COMMENTS
Arthropoda	Insecta	Coleoptera		Elmidae	1	
Arthropoda	Insecta	Odonata	Anisoptera	Gomphidae	1	
Arthropoda	Insecta	Odonata	Zygoptera	Coenagrionidae	7	
Arthropoda	Insecta	Collembola		Sminthuridae	32	
Arthropoda	Insecta	Ephemeroptera	Nesphomera	Oligoneuriidae	6	
Arthropoda	Insecta	Ephemeroptera		Caenidae	3	
Arthropoda	Insecta	Diptera		Psychopteridae	28	
Arthropoda	Insecta	Diptera		Chironomidae	28	
Arthropoda	Insecta	Megaloptera		Sialidae	4	
Arthropoda	Insecta	Trichoptera		Hydropsychidae	7	
Arthropoda	Insecta	Hemiptera		Corixidae	8	
Arthropoda	Insecta	Lepidoptera		Pyralidae	3	
Annelida		Hirudinea		Piscicolidae	1	
Annelida		Hirudinea		Glossiphoniidae	1	
Annelida	Oligochaeta	Haplotaxida		Naididae	1	
Gastropoda		Limnophila		Lymnaeidae	2	
Pelecypoda					1	
				TOTAL:	134	

Drawn by: RU
Chkd by: DM

Wright Water Engineers, Inc.
10/4/00

City of Lincoln
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